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THE RELATIONSHIP BETWEEN BACK PROBLEMS AND A DISEASE-SPECIFIC MEASURE OF PAIN AND FUNCTIONAL LIMITATIONS IN INDIVIDUALS WITH OSTEOARTHRITIS

M. Stupar[1], P. Côté[1], M.R. French[2], G.A. Hawker[2]
[1]Toronto Western Hospital, Toronto, ON, Canada; [2]Women's College Hospital, Toronto, ON, Canada

Purpose: Estimates of back pain prevalence in hip and knee OA from cross-sectional, clinical studies range from 51.5% to 54.6%. One prospective clinical cohort study has found that pre-operative absence of low back pain was an independent predictor of better post-operative outcome (WOMAC scores) following total knee replacement surgery. To-date, no population-based cohort study has investigated the relationship between low back pain and lower limb OA. Our objective was to determine whether self-reported, back pain predicts greater hip or knee pain, stiffness and/or physical functional limitations in a cohort of individuals with hip and/or knee OA at two-to-four years.
Methods: We conducted a population-based cohort study. Subjects were included if they lived two regions of Ontario (Canada) and were at least 55 years of age. Data was collected between 1996 and 1998 (baseline) and between April 1, 2000 and March 31, 2001 (follow-up). Subjects completed an interviewer-administered questionnaire at baseline and follow-up that included information on demographics, general health and the presence and location of back pain. Standardized instruments were used to measure the severity of osteoarthritis (WOMAC) and general health status (SF-36). Data was analyzed using multivariable linear regression with the total and subscale WOMAC scores as the outcome variables. We built two regression models using "lower back pain" and "persistent neck and back problems" as the main exposures. We tested the potential confounding effect of baseline WOMAC scores, age, gender, body mass index (BMI), income, education, number of troublesome joints, sum of comorbid conditions, general health, mental health and social functioning SF-36 scores.
Results: The mean age of the cohort was 69.71 (SD=8.29) years at baseline, the mean BMI was 30.15 (SD=10.03), the mean total WOMAC score was 39.36/100 (SD=18.81) and 74.2% were female. The cohort participants had an average of two non-musculoskeletal, comorbid conditions (1.87; SD=1.53), 58.0% reported having lower back pain and 63.5% reported having persistent back or neck problems. Those with back problems had a higher proportion of females, a higher mean sum of comorbid conditions and a higher mean WOMAC score at baseline compared to those without back pain. In the crude association model, low back pain [beta=7.271; 95% CI 4.691-9.851] and persistent neck and back problems [beta=6.129; 95% CI 3.794-8.465] were associated with higher WOMAC scores at follow-up. This association between low back pain and WOMAC scores at follow-up was partially explained by confounders (age, gender, body mass index, income, education, number of troublesome joints, sum of comorbid conditions, baseline WOMAC scores and general health, mental health and social functioning domains of the SF-36) [beta=2.740; 95% CI 0.344-5.135]. Similarly, the association between a lifetime history of persistent neck and back problems and WOMAC scores at follow-up was partially explained by confounders [beta=1.867; 95% CI -.306-4.039]. Similar results were demonstrated within the pain and physical function domains.
Conclusions: In our cohort, low back pain predicted higher WOMAC scores at 2-4 years follow-up. Further studies should determine the exact contribution of low back pain on lower limb OA symptoms and disability since the change in WOMAC scores suggests that there is significant confounding in the association between back pain and hip/knee OA. Clinicians should be aware of the possible role of low back pain as an important comorbidity in patients with hip and knee OA if shown to be clinically significant.

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ARTHROSCOPIC DEVICE MEASURING STREAMING POTENTIALS RELIABLY INDICATES FUNCTIONAL PROPERTIES OF CARTILAGE

M. Garon[1], A. Légaré[1], É. Quenneville[1], T.J. Sims[2], A.P. Hollander[2], M.S. Shive[1], A. Restrepo[1], M.D. Buschmann[3]
[1]Bio Syntech Canada Inc., Laval, PQ, Canada; [2]University of Bristol Academic Rheumatology, Department of Clinical Science at North Bristol, Avon Orthopaedic Centre, Southmead Hospital, Bristol, United Kingdom; [3]Biomedical & Chemical Engineering, Ecole Polytechnique, Montréal, PQ, Canada

Purpose: Pharmaceutical treatments are under development to prevent, delay or reverse OA, however no satisfactory clinical outcome measure for cartilage health versus disease is currently available. To satisfy this unmet need, a new medical device for the quantitative assessment of cartilage electromechanical properties during arthroscopy was developed. The purpose of this study was to evaluate the reliability of cartilage assessments made with this device and to correlate its output parameters to biochemical, biomechanical and topographical properties of human articular cartilage.
Methods: The medical device tip is a sensor with 37 micro-electrodes evenly distributed over the surface of a 3.2 mm radius hemispherical indenter (Fig. 1). The indenter was manually compressed against articular cartilage surface and induced streaming potentials were recorded. A quantitative parameter was calculated by integrating all measured streaming potential signals versus time over the spherical surface of the indenter that is in contact with the cartilage. Readings were obtained at 102 positions on the articular surfaces of one human cadaver knee creating a quantitative parameter map. Five users performed 3 consecutive mappings. 27 cartilage disks, with a thin layer of bone, were then isolated and tested in unconfined compression to obtain the equilibrium modulus, the fibril modulus and the hydraulic permeability. Cartilage disks were also analyzed for the contents of collagen and both mature and immature collagen crosslinks. The reliability of the cartilage assessments obtained with the device among different users was evaluated using the intraclass correlation coefficient (ICC).

Figure 1. Medical device sensor.

Results: The quantitative parameter obtained with the medical device correlated with cartilage fibril modulus, cartilage thickness, collagen content and the ratio of mature to immature crosslinks. Surface maps of the quantitative parameter overlaid on corresponding images of the articular cartilage surfaces (Fig. 2) displayed patterns that depended on the particular joint surface, central versus peripheral position, and on whether the cartilage was covered or not covered by the meniscus. While the maps of tibial plateaus under menisci displayed symmetric

and regular patterns, the maps of opposing femoral condyles were less regular. We found that the lower values of the quantitative parameter on the medial condyle (blue regions in Fig. 2) surrounded a visible defect (red star on Fig. 2) but extended beyond the visible defect to possibly indicate the extent of incipient cartilage degeneration. The computed ICC was 0.87 indicating that different users had a minimal effect on the medical device's quantitative parameter.

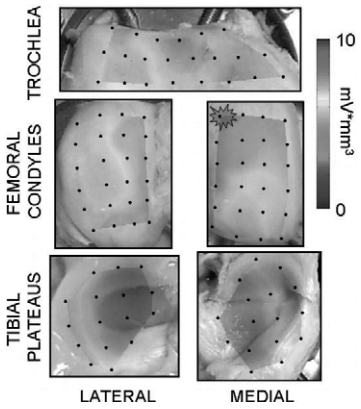

Figure 2. Quantitative parameter maps.

Conclusions: Streaming potentials measured with this device were easily obtained and provide a user-independent and non-destructive indicator of biomechanical properties and biochemical composition of human articular cartilage. This medical device is not yet approved for sale in any country, however, the promising results to date suggest a potential clinical use for quantifying cartilage function on joint surfaces during arthroscopy as well as an outcome measure for evaluating OA therapies.

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COMPUTER NAVIGATION IN TOTAL HIP REPLACEMENT: A META ANALYSIS

R. Gandhi[1], A. Marchie[1], F. Farrokhyar[2], N. Mahomed[1]
[1]University of Toronto, Toronto, ON, Canada; [2]McMaster University, Hamilton, ON, Canada

Purpose: To perform a meta-analysis of the best available evidence to evaluate the reliability of computer navigation in achieving optimal acetabular alignment.
Methods: We searched, in duplicate, major medical databases and conducted hand searches of relevant bibliographies for randomized trials. The methodological quality of the studies were scored and tests of heterogeneity and publication bias were performed. We then abstracted relevant data on the primary outcome of acetabular alignment. The mean differences and odds ratios with 95% confidence intervals (CI) are reported.
Results: Of the 384 potential studies identified, 3 prospective randomized trials were included in the analysis. There was no evidence of publication bias or statistical heterogeneity between studies. The pooled mean difference for the abduction angles was -0.098 (95% CI: -0.363 to 0.168), p=0.470. The pooled mean difference for the anteversion angles was -0.436 (95% CI: -0.797 to -0.074), p=0.019. The nominally and statistically significant beneficial odds ratio for the number of outliers was 0.285(95% CI: 0.143 to 0.569) $p<0.001$.
Conclusions: The results of this study demonstrate that there are few prospective randomized trials evaluating the use of computer navigation in hip arthroplasty. With the numbers available, we found computer navigation improves accuracy in acetabular anteversion and decreases the number of outliers from the desired alignment while it made no difference in abduction angles. Further study of larger patient numbers with appropriate outcome measures are still needed.

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RADIOLOGICAL FINDINGS IN A COHORT OF EARLY OSTEOARTHRITIS, THE CHECK STUDY

J. Wesseling, J. Dekker, P. Decker, M. Kloppenburg, F.P. Lafeber, R.G. Nelissen, A. Oostveen, M. Reijman, M.A. Viergever, J.W. Bijlsma
Rheumatology & Clinical Immunology, University Medical Center Utrecht, Utrecht, The Netherlands

Purpose: The diagnosis osteoarthritis (OA) can be based on complaints, clinical signs and/or radiographic findings. In hip and knee OA studies different definitions for the diagnosis of OA are used, however for early OA there is not a clear definition. It is important for prevention and intervention to have opportunities to diagnose the disease in the early stage. We started a prospective 10-year follow-up study on the onset and progression of OA in participants with early complaints of hip and/or knee: CHECK (Cohort Hip& Cohort Knee) and evaluated the role of plain radiographs in an early stage.
Objective: to investigate whether participants fulfill the clinical ACR criteria of hip or knee OA and to focuse on the radiographic data measured by the Kellgren and Lawrence score (K&L).
Methods: A participant was included if he has complaints (pain and/or stiffness) of knee and/or hip, is aged 45- 65 years, has never or not longer than 6 months ago visited the general practitioner for these complaints. The visits at the study center include radiographic evaluation at years 0,2,5 and 10. Five radiographic views of the knees were obtained- weightbearing posterioranterior (PA), lateral and supine skyline. Also a weightbearing anteriorposterior (AP) view of the pelvis and faux profile view of the hips were performed. All painful joints of the participants were analyzed. In participants with unilateral knee or hip pain, only the painful joint had to satisfy the ACR criteria or K& L definition for OA. In those with bilateral pain, both painful joints have to satisfy these criteria. The Kellgren and Lawrence score were performed at the PA view of the knees and the AP view of the pelvic and score ≥ 2 was diagnosed as radiographic OA.
Results: A total of 1002 participants were included, 792 women and 210 men; mean age 56 years, mean BMI 26 kg/m^2. Of the 826 painful knee joints 80% fulfilled the clinical ACR criteria (unilateral 78%, bilateral knee pain 81%). Only 27% of the unilateral painful hip joints and 19% bilateral fulfilled the clinical ACR criteria. Radiographic knee osteoarthritis was found in 26 unilateral painful joints(7%)and 12 (3%)bilateral painful knee joints, with at least K& L grade 2. For the hip the percentage were almost the same, respectively 8% (31) and 3% (6).
Conclusions: The CHECK study is a cohort of participants with complaints of hip or knee. The complaints of the knee joints can be diagnosed as osteoarthritis in the majority of participants according to the clinical ACR criteria. Only 75 (8%) participants had radiographic OA in this early phase. Therefore we conclude that we were able to collect a cohort of early OA.
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